

***HALYOMORPHA HALYS* (STÅL) (HETEROPTERA: PENTATOMIDAE):
A POLYPHAGOUS PLANT PEST FROM ASIA NEWLY DETECTED IN
NORTH AMERICA**

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Abstract.—The Asian pentatomid *Halyomorpha halys* (Stål) (Heteroptera) is reported for the first time in North America based on collection of specimens or confirmed sightings in five counties in eastern Pennsylvania. Known in the Asian literature as the yellow-brown or brown marmorated stink bug, *H. halys* is considered a significant horticultural pest in Japan; it has a broad host range that includes plants of economic importance such as pea, soybean, apple, peach, cherry, and various other fruit and ornamental trees. In Japan's northern regions it is regarded as a nuisance pest late in the season when adults aggregate and seek overwintering sites in and around houses and commercial establishments. Descriptions and photographs of the adult and immature stages are provided to help distinguish it from other North American pentatomids. Habits, seasonal history, and host plants, based on the Asian literature and our own observations, are summarized. Photographs of leaf-feeding damage are also provided. *Halyomorpha halys* may have been accidentally introduced with international commerce, i.e., via bulk freight containers from either Japan, Korea, or China.

Key Words: Heteroptera, Pentatomidae, *Halyomorpha halys*, North America, adventive species, Pennsylvania

In late September of 2001, two specimens of a pentatomid stink bug, collected in Allentown, Pennsylvania (Lehigh County), were submitted to the Cornell University Insect Diagnostic Lab by Karen M. Bernhard (KMB), an extension entomologist with the Lehigh County Cooperative Extension office. They proved to be *Halyomorpha halys* (Stål), an Asian species not known previously to occur in North America. Numerous log records of homeowners' inquiries of stink bugs being found in and around homes in the greater Allentown region over the past several years (compiled by KMB) indicate that populations of this exotic stink bug are well established in Lehigh County and to a lesser degree in sur-

rounding counties in eastern Pennsylvania. Further surveys are needed to determine the full geographic range of this introduced plant pest in the eastern United States.

The earliest confirmed U.S. sighting of *H. halys* is from Adams Island (Allentown) in the fall of 1996. We are also aware of stink bug sightings in Allentown in September of 1998 and January of 1999. Since these initial sightings, homeowners of the region have made numerous telephone calls complaining of this bug to the extension office of Lehigh County. After ERH identified the two specimens on October 1, 2001, he joined KMB on October 3 in Allentown to make further observations and to collect additional specimens. On that unseasonably

warm day, adults of *H. halys* were extremely numerous on the foundations, outer wall surfaces, eaves, and window and door frames of homes, and sidewalks.

In this paper, we provide the first North American records for *H. halys*; review the literature on seasonal history, habits, economic damage, and host plants; provide notes on our own rearing data; and redescribe and give color photographs of the adult and immature stages that allow it to be distinguished from similar-appearing North American pentatomids.

SYSTEMATICS

Halyomorpha halys (Stål)

(Figs. 1–7)

Pentatoma Halys Stål 1855: 182.

Poecilometis mistus Uhler 1860: 223. Synonymized by Josifov and Kerzhner 1978: 172.

Dalpada brevis Walker 1867: 226. Synonymized by Josifov and Kerzhner 1978: 172.

Dalpada remota Walker 1867: 227. Synonymized by Josifov and Kerzhner 1978: 172.

Halyomorpha picus: auctorum (nec Fabricius 1794: 115).

Halyomorpha halys: Josifov and Kerzhner 1978: 172.

Note.—Josifov and Kerzhner (1978) determined that only one species of *Halyomorpha* is found in Japan, Korea, and eastern China. All citations pertaining to *Halyomorpha* species from these localities should be referred to *H. halys* (Rider et al. in press). There are currently 37 species of *Halyomorpha* recognized, of which 16 are African, 8 are Indian, and 13 are Asian. There is, however, considerable confusion surrounding several species; a generic revision is needed.

Diagnosis.—The only eastern North America pentatomids that resemble *Halyomorpha halys* in overall size (12–17 mm) and its dark “marbled” dorsal coloration are species of the genus *Brochymena*

Amyot and Serville (tribe Halyini). Members of *Brochymena*, however, have the juga each with a tooth on the outer side subapically and the pronotum with the anterolateral margins coarsely dentate. By comparison, *H. halys* lacks teeth on the outer juga subapically and the anterolateral margins of the pronotum are not dentate, but entire.

Among members of the tribe Pentatomini *sensu* Rolston and McDonald (1979) (to which *H. halys* belongs; many Old World workers place *Halyomorpha* in the tribe Cappaeini which at present has no known representatives in the New World), only the taxa *Euschistus* Dallas, *Holcostethus* Fieber, and *Thyanta* Stål might be confused with *Halyomorpha*. *Euschistus* species are recognized by the conspicuous ostiole (of the metathoracic scent gland) usually with a distinct, well-developed auricle (similar to a small earlike or flaplike process or lobe). Also in *Euschistus*, the hind tibiae are distinctly sulcate dorsally throughout their lengths. In *Halyomorpha*, the metathoracic scent gland ostiole is without a developed auricle but has an elongate tapering channel extended beyond the middle of the supporting or evaporative plate, and the hind tibiae are without a dorsal sulcus.

Halyomorpha keys to *Thyanta* in McPherson (1982). *Thyanta* species, however, are generally smaller (7–11 mm) and the dorsal surface is chiefly or entirely green or pale tan (overwintering forms). In Slater and Baranowski (1978), *Halyomorpha* will trace to the genus *Holcostethus*. In *Holcostethus*, the metathoracic scent gland is produced into an elongate tapering channel as in *Halyomorpha*. In contrast, *Holcostethus* is smaller (7–9 mm); has the apices of the juga rounded, converging, and frequently contiguous in front of the tylus; and differs in general shape and coloration. Also in *Halyomorpha*, the connexiva are usually broadly exposed (hemelytra not covering them), revealing the distinctive alternating pattern of black and pale patches. The fourth antennal segment is annulated (pale

white) at the base and apex, and the fifth segment is annulated at the base. The venter of the adult (thoracic sterna, abdomen, and leg bases) is distinctly pale luteous.

Redescription.—*Adult* (Fig. 1): Length 12–17 mm.; width across humeral angles 7–10 mm. Variable in color and size. Generally brownish cinereous, but also greyish ochraceous, ochraceous, testaceous, or castaneous, densely and darkly punctate. Head broadly rounded in front, surface densely punctured with black, lateral margins narrowly reflexed and slightly sinuate, tylus and juga nearly equal in length (tylus perhaps slightly longer); eye large, sessile; rostrum reaching second abdominal segment. Head, anterior and lateral areas of pronotum more or less heavily punctured with black, coarse punctures; basal angles of scutellum pale luteous or yellow, without punctures. Hemelytra mottled with brown, densely punctured, slightly tinged with reddish on apex of corium, apical membrane yellowish hyaline, with veins marked with dark brown. Body beneath and legs generally pale luteous; lateral areas of head, prosternum, and abdominal sterna more or less densely punctured; punctures black to somewhat metallic green. Legs pale reddish yellow; sparsely pubescent; distal half of femora and most of tibiae densely punctured with black.

Detailed line drawings of eggs and all nymphal instars of *H. halys* are available in Kobayashi (1956, 1967) and Hoffmann (1931). The following key to instars and nymphal measurements and descriptions are taken, in part, from Kobayashi (1956, 1967).

KEY TO INSTARS OF *HALYOMORPHA HALYS*

- 1. Anterior wing pads not developed (Figs. 3–5) 2
 - Anterior wing pads well-developed (Figs. 6–7) 4
- 2. Middle of each tibia without a white band (Figs. 3–4) 3
 - Middle of each tibia with a white band (Fig. 5) Third instar

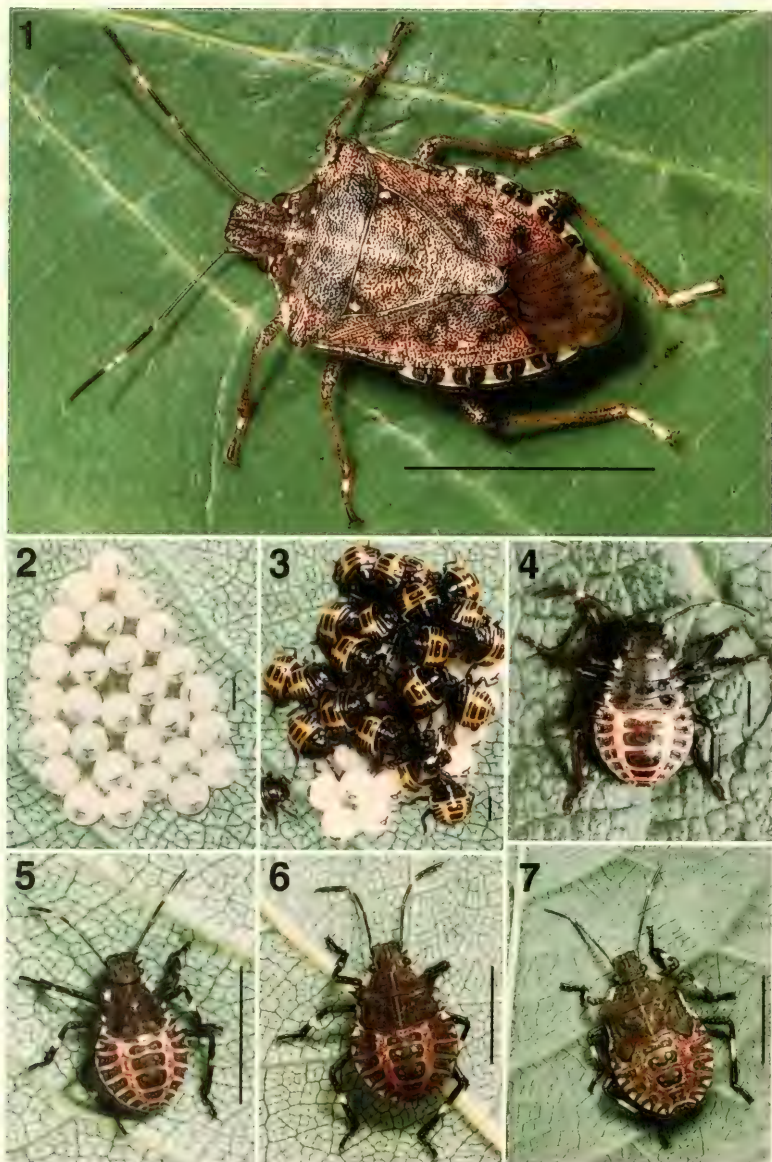
- 3. Eyes not projecting (Fig. 3) First instar
 - Eyes spherically projecting (Fig. 4) Second instar
- 4. Posterior wing pads not developed (Fig. 6) Fourth instar
 - Posterior wing pads conspicuously developed (Fig. 7) Fifth instar

Egg and egg cluster (Fig. 2): Length approximately 1.6 mm, diameter 1.3 mm, elliptical, chorion whitish with fine reticulation with minute spines. Micropylar projections 30–32, capitate, white. Egg burster chitinated, blackish, T-shaped. Egg cluster consisting generally of 20–30 eggs, arranged more or less regularly.

First instar (Fig. 3): Length approximately 2.4 mm. Body elliptical, not depressed. Head roundish, triangular. Head, thorax, dorsal plates, connexiva, and legs black, except lateral portions of each thoracic tergum and each connexivum subhyaline or pale. Abdomen mostly yellowish red. Eye darkish red. Antenna reddish black.

Second instar (Fig. 4): Length approximately 3.7 mm. Body egg-shaped, more or less depressed. Head rectangular, with pair of hornlike projections in front of eyes. Head, thorax, dorsal plates, and connexiva mostly black, except lateral portions of each thoracic tergum and each connexivum subhyaline. Abdomen whitish with reddish spots and reddish junctions. Eye reddish black. Antenna reddish black except apical portion of third antennomere white. Legs blackish brown. Body above with large scattered punctures.

Third instar (Fig. 5): Length approximately 5.5 mm. Body pear-shaped, rather depressed. Head rectangular, with pair of hornlike projections in front of eyes. Head, thorax, dorsal plates, and connexiva mostly brownish black, except apical portion of median lobe near inner margins of lateral lobes, anterior portion of head in front of eyes, middle and some spots on thorax, lateral portions of anterior half of pronotum, middle of mesonotum and entire metano-



tum, anterior portions of orifices of scent glands and middle portions of connexiva mostly yellowish brown. Abdomen whitish with reddish spots and junctions. Eye and antenna colored as in second instar. Legs blackish brown, except bases of femora and middle of tibiae white.

Fourth instar (Fig. 6): Length approximately 8.5 mm. Body as in previous instar, pear-shaped, rather depressed. Coloration of body almost same as third instar. Antenna reddish black, except apex of third antennomere and base of fourth antennomere yellowish white. Femora brown, scattered with black spots, except bases yellowish white. Tibiae and tarsi blackish brown except middle of each tibia yellowish white. Purplish black, shallow depression on inner surface of each connexivum at middle.

Fifth instar (Fig. 7): Length approximately 12 mm. Body as in previous instar, pear-shaped, rather depressed. Head, thorax, dorsal plates, and connexiva mostly brownish black with metallic luster, except some spots on head and thorax yellowish and some yellowish white spots on connexiva. Anterior half of anterolateral margins of pronotum, lateral margins of mesonotum and middle of lateral margins of connexiva all whitish subhyaline. Abdomen luteous-white, with dense covering of black, metallic punctures, reddish junctions, and reddish spots. Eye reddish black. Antenna black, except apex of third and base of fourth antennomeres whitish. Femora mottled blackish brown, bases whitish. Tibiae and tarsi mostly brown, except middle of tibiae white and apices of tarsi black.

Thoracic sterna, including leg bases (coxae, trochanters, and basal areas of femora) and abdominal venter of all instars, particularly the fifth (Fig. 8), whitish, sharply



Fig. 8. Fifth-instar nymph of *Halyomorpha halys*, ventral aspect. Scale line = 5 mm.

ly contrasting with darker lateral margins of thorax and abdomen.

SUMMARY OF BIONOMICS AND HABITS

Aspects of the seasonal history, ecology, and developmental stages of *H. halys* (often cited as *H. picus*, *H. brevis*, or *H. mista* in the Asian literature) have been reported by Nozu and Sonoyama (1924), Suzuki (1924), Shizuoka Agricultural Experiment Station (1925), Takahashi (1930), Hoffmann (1931), Abe and Mori (1942), Fukuda and Kitajima (1956), Kobayashi (1956, 1967, 1981), Saito et al. (1964), Yanagi and Hagihara (1986), Fujiie (1984, 1985), Kawada and Kitamura (1983a, b), and Chu and Zhou (1997).

Overwintered adults emerge from their

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Figs. 1–7. *Halyomorpha halys*. 1, Adult. 2, Egg cluster. 3, First-instar nymphs. 4, Second-instar nymph. 5, Third-instar nymph. 6, Fourth-instar nymph. 7, Fifth-instar nymph. Scale line for Fig. 1 = 10 mm; for Figs. 2–4 = 1 mm; for Figs. 5–7 = 5 mm.

hibernation sites in early spring (probably by early to mid-April). Mating and egg laying do not commence until about two weeks after adults emerge from overwintering sites. Under laboratory conditions, adults require 14–15 days from imaginal ecdysis to become sexually mature (Kawada and Kitamura 1983b). Sexually mature females usually mate on multiple occasions, as many as five times per day (Kawada and Kitamura 1983b). A female, mated only once, can lay eggs for nearly half her life span, but fecundity decreases in proportion to her age. The period of laying fertile eggs and fecundity increase with multiple copulations. Females deposit eggs on the lower leaf surfaces of host plants from May to late August. Egg clusters commonly contain 20 to 30 eggs, which hatch 4–5 days after deposition. As with other pentatomids, *H. halys* has five nymphal instars (Kawada and Kitamura 1983b).

Emerging adults of the first generation are generally observed in early to mid-August. Adults are most numerous in early August in parts of Korea (Chung et al. 1995). In Tsukuba, Japan (Ibaraki Prefecture), first generation adults are not found until early to mid-September. Light trap records in Japan, from 1978 to 1986, indicate a single peak occurrence in most years from late July to early August (cited as *H. mista*) (Moriya et al. 1987). In the Allentown area (Lower Macungie Twp., The Rodale Working Tree Center), fifth-instar nymphs and teneral adults were common on foliage on August 23, 2002 (Gary Bernon, in litt.).

Only one generation is produced annually throughout most of the native range, but 1–2 generations have been reported (as *H. picus*) for central and southern Hebei Province, China (Zhang et al. 1993). Zhang et al. (1993) also noted that overwintered adults, with an average life span of 301 days, emerged from their overwintering sites from early April to mid-June. New generation adults seek overwintering sites from late August to late October. Hoffmann (1931) also reported multiple annual gen-

erations in south China, near Canton. He noted that the first generation is completed before the middle of June, and that there are at least four, and possibly six, annual generations. There, eggs have been observed at the end of September and nymphs as late as mid-October.

Duration of immature stages.—Nymphal development of *H. halys* apparently varies significantly depending on the location in Asia. For example, near Canton in south China, nymphs (cited as *H. picus*) developed to the adult stage in as little as 27 days (Hoffmann 1931). In another laboratory study (Kadosawa and Santa 1981), nymphal development ranged from 29 to 54 days on soybean seed. In two separate rearing trials conducted in 1963 in the mountainous areas of the Tohoku districts in Japan, Saito et al. (1964) found that when eggs of *H. halys* (also cited as *H. picus*) were laid in mid-summer (July 11), presumably by overwintered females, adults appeared by August 19 (40 days for complete development from egg through five instars to adult). When eggs were laid in late summer (August 3), adults did not appear until October 3 (62 days for complete development). Developmental times from egg hatch through five instars in midsummer in the mountains of Japan's Tohoku districts were as follows: egg (6 d), instar I (5 d), instar II (6–7 d), instar III (7–9 d), instar IV (6–8 d), and instar V (7–10 d). For eggs deposited later in the summer (August 3), developmental times increased moderately, particularly for fourth and fifth instars: eggs (5 d), instar I (4 d), instar II (7–11 d), instar III (7–11 d), instar IV (15–19 d), and instar V (16–22 d) (Saito et al. 1964).

One of us (MEC) reared *H. halys* in captivity [at room temperature (20–22°C) and natural photoperiod (June–July)] to gain information on numbers of eggs in an egg cluster and on developmental times for the immature stages (beginning with 10 overwintered adults collected in Allentown on June 6, 2002). Egg clusters ($n = 5$; range of number of eggs/cluster = 25–28, mean

= 26.8) were placed individually in small plastic boxes and supplied with cut stems (in aquapics) of leaves and fruits of common chokecherry (*Prunus virginiana* L.) and changed every few days. Individuals from these five egg clusters were reared to adults. Our observations do not vary significantly from those reported in the Japanese literature, especially from localities in northern Japan. Developmental times were as follows: egg (5–9 d, mean = 7.2), instar I (4–6 d, mean = 5.4), instar II (5–9 d, mean = 7.2), instar III (5–8 d, mean = 6), instar IV (5–7 d, mean = 6.2), and instar V (9–11 d, mean = 10.25).

HOST PLANTS AND FEEDING DAMAGE

Halyomorpha halys is a polyphagous horticultural pest of some importance in Japan and elsewhere in its geographic range (Panizzi et al. 2000). In Japan, it severely injures various shade and fruit trees, vegetables, pulses, and leguminous crops (Kobayashi 1967). In southern China, adults and nymphs cause considerable damage to flowers, stems, and pods of various beans, and also feed on flowers of *Hibiscus rosa-sinensis* L., stems of *Celosia argentea* L., and fruits of *Solanum nigrum* L. and *Basella rubra* L. (Hoffmann 1931). Host plants of economic significance include *Citrus* (citrus), *Diospyros kaki* L. (persimmon), *Ficus* (fig), *Glycine max* Merrill (soybean), *Malus domestica* L. (apple), *Morus* (mulberry), *Paulownia* spp. (paulownia), *Prunus avium* L. (cherry), *P. mume* Siebold and Zuccarini (ume, Japanese apricot), *P. persica* Batsch (peach), *Pyrus pyrifolia* Nakai (pear), and reportedly some weeds (including *Arctium* spp.) (Shiraki 1952; JPPS 1966; Fujie 1984; Yoshii and Yokoi 1984; Yuan 1984; Yasunaga et al. 1993; Chung et al. 1995; Funayama 1996, 2002; Watanabe 1996; Chu and Zhou 1997). Adults generally feed on fruit, whereas nymphs feed on leaves, stems, and fruits.

Halyomorpha halys is one of approximately 50 insects that are considered major pests of various leguminous crops, and par-

ticularly soybean, in Japan (Kadosawa and Santa 1981, Kobayashi 1981, Kobayashi et al. 1972, Kobayashi and Oku 1976), Korea (Son et al. 2000), and China (Hoffmann 1931). Adults and nymphs of *H. halys* can cause serious yield loss by sucking sap from soybean seeds (Kadosawa and Santa 1981). The most serious damage to tree fruit (persimmon, for example) is observed from late August to late October in Korea (Chung et al. 1995). In Japan, most adult feeding damage to 'Fuji' apples is from early to mid-August, with the fruit most susceptible to sucking (stylet) injury during the thickening period; the actual feeding injury appears as pitting and discoloration of the flesh (Funayama 1996). In non-astringent persimmon orchards in Korea, severe feeding symptoms by *H. halys* include physical changes of the fruit, such as concaving of the surface or its becoming dark blue in a "bull's-eye" configuration and the flesh becoming soft and "spongy" (Chung et al. 1995).

Paulownia, which includes six species of deciduous trees native to China, is also a host for *H. halys* and it too can be severely affected by this stink bug. Species of this plant genus (at least two species are naturalized in the United States) have been planted as superior trees for more than 2000 years in eastern Asia. *Paulownia* species are highly suitable and popular as intercropping species in modern agroforestry and are used commonly for urban shelterbelts due to their rapid growth and attractive high-canopy formation (Hiruki 1999). *Paulownia* witches' broom, one of the mycoplasma diseases, is vectored or disseminated primarily by *H. halys* (Jin et al. 1981, Zhu et al. 1982). *Paulownia* witches' broom can greatly reduce the growth and vigor of trees, their severe decline causing premature death (Shiozawa and Tsuchizaki 1992). In Japan, this disease represents a serious threat to the production of paulownia (*P. tomentosa* Steudel) timber, which is much used in the Orient for cabinet wood.

To determine host plant preferences and

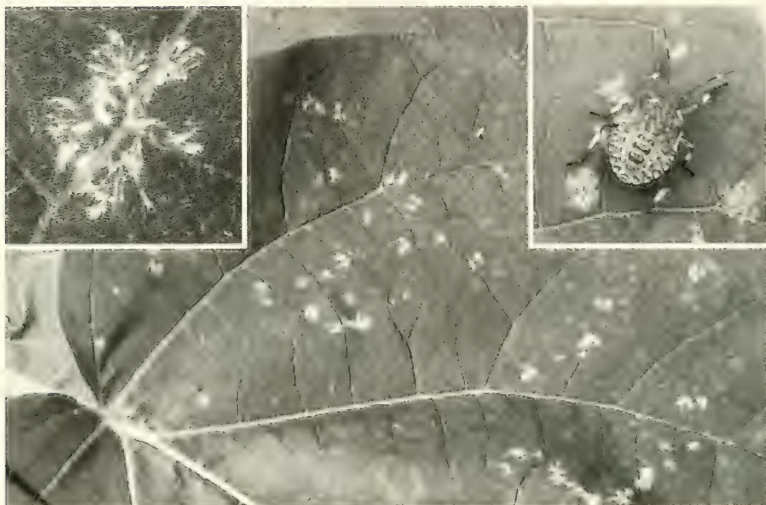


Fig. 9. Feeding damage to *Paulownia* leaf (*Paulownia tomentosa*) by *Halyomorpha halys*. Upper left insert: magnification of leaf damage at feeding site; upper right insert: fifth-instar nymph feeding.

feeding damage potential in North America, periodic surveys were conducted throughout the greater Allentown area in the spring and summer of 2002 by KMB and James F. Stimmel (Pennsylvania Dept. of Agriculture, Harrisburg) (JFS, personal communication). In late May and early June, adults (presumably overwintered) were beaten from the foliage of various trees and shrubs, including honeysuckle (*Lonicera* sp.), walnut (*Juglans* sp.), shadbush (*Amelanchier* sp.), butterfly-bush (*Buddleia* sp.), paulownia (*Paulownia tomentosa*), persimmon, and maples (*Acer* spp.). By early to mid-July, nymphs of several instars were beaten from some of the same foliage, as well as from basswood (*Tilia* sp.) and catalpa (*Catalpa* sp.) seedlings (KMB, personal communication). According to JFS (personal communication), fourth- and fifth-instar nymphs were abundant on persimmon and paulownia foliage at the Rodale Working Tree Center in the western part of Allentown. Nearby, at a private residence, a large

population (perhaps hundreds) of nymphs, mostly fourth instars, were observed on a small and isolated group of butterfly-bushes (*Buddleia*). The nymphs fed on the leaves of *Buddleia* and *Paulownia*. Feeding damage on these hosts appeared as "stippled" areas, roughly circular and one-eighth inch in diameter. Under magnification, this "stippled" area is seen to consist of areas where the plant cells have been depleted in a "crow's-foot" pattern (see Fig. 9). As injury progresses, the previously "stippled" areas become brown and scablike.

STATUS AS A NUISANCE PEST

In Asia, *H. halys* overwinters as adults and aggregates, sometimes in large numbers, on the outside of buildings when it is seeking hibernation sites in the fall (Kobayashi and Kimura 1969). The invasion of homes, commercial establishments, and schools makes this stink bug a very serious nuisance pest in Japan (Inaoka et al. 1993, Watanabe et al. 1994a, b). The flight of *H.*

halys to wall surfaces of buildings starts at the end of September and peaks around the third week in October. Adult flight ceases by the end of November.

Similar aggregation and flight behavior have been observed in Pennsylvania for *H. halys* in residential areas in the fall of 2001. Wherever *H. halys* becomes established in the United States, it likely will become a serious household nuisance in a manner similar to the western conifer seed bug, *Leptoglossus occidentalis* Heidemann; the boxelder bug, *Boisea trivittata* (Say); and the multicolored Asian lady beetle, *Harmonia axyridis* (Pallas) (Mallis 1997).

DISTRIBUTION

Halyomorpha halys is reported from Japan (Honshu, Shikoku, Kyushu), Korea, China (Anhui, Hebei, Heilongjiang, Henan, Jiangsu, Jilin, Liaoning, Nei Monggol, Shaanxi, Shanxi, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Xizang, and Yunnan), and Taiwan (Kobayashi 1967; Rider et al. in press).

Pennsylvania (Fig. 10), with 5 confirmed counties (Bucks, Lehigh, Monroe, Northampton, and Pike) to date, is a new record for the United States and the Western Hemisphere. Confirmed sightings, based on credible descriptions provided by homeowners and, in some cases, specimens provided, validate the establishment of *H. halys* in numerous communities in and around the Allentown/Bethlehem area, and from surrounding counties. These include: *Pike Co.*: Peck's Pond. *Monroe Co.*: Saylorsburg, Swiftwater. *Northampton Co.*: Northampton, Easton. *Lehigh Co.*: Orefield, Allentown/Bethlehem (including the following areas: Adams Island, Butztown, Catsauqua, Coopersburg, Coplay, Center Valley, Cetronia, Dorneyville, East Texas, Emmaus, Freemansburg, Fountain Hill, Greenawalds, Hellertown, Lanark, Macungie, Neffs, Springhouse Farms, Stiles, Walnutport, West Catsauqua, Westgate Hills, Whitehall, and Zionsville). These records

are not listed below under "Material examined," but are mapped in Fig. 10.

Material examined.—All in the Cornell University Insect Collection (CUIC), Ithaca, NY, except as noted. *PENNSYLVANIA*: *Bucks Co.*: Perkasio, 26 January 2002, R. Miller [1]. *Lehigh Co.*: Allentown, Albright Avenue (private residence), 21st Street (apartment complex), 3 October 2001, ERH and KMB [27, including 4, National Museum of Natural History (Washington, DC); 2, North Dakota State University (Fargo); 2, Florida State Collection of Arthropods (Gainesville)]; Girard Avenue (private residence), 3 October 2001, S. Yoder, coll. [4]; Muhlenberg College campus and Trexler Memorial Park, 6 June 2002, ERH [10].

INTERCEPTIONS AT PORTS-OF-ENTRY

North American interceptions of this exotic stink bug have been infrequent. For the period 1973–1987, only two interceptions of a species of *Halyomorpha* at U.S. ports-of-entry were recorded in the USDA's "List of Intercepted Plant Pests"; both were identified as *Halyomorpha picus* (probably *H. halys*). One was intercepted in an aircraft from Japan in 1983 and the other in baggage from Korea in 1984. For 1989 to 1998, the USDA-APHIS's Port Information Network (PIN) database lists eight interceptions of *Halyomorpha* from China, Korea, or Japan from aircraft, machinery and woodenware crating, machinery crating and miscellaneous cargo, and tractor soil (Peter Touhey, personal communication).

Established populations of *H. halys* that were found in eastern Pennsylvania might have originated from aggregations of overwintering adults that were accidentally introduced with international commerce, i.e., via bulk freight containers from Japan, Korea, or China.

ACKNOWLEDGMENTS

We thank Karen M. Bernhard (Lehigh County Cooperative Extension, Allentown, PA), James F. Stimmel (Pennsylvania De-

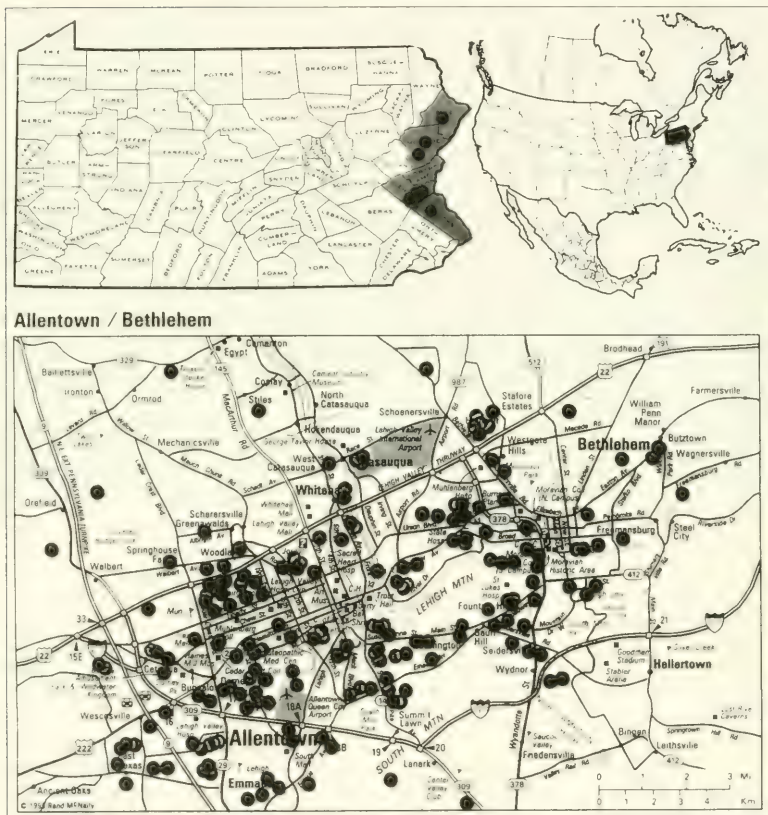


Fig. 10. County distribution of *Halyomorpha halys* in eastern Pennsylvania (upper left). Confirmed sightings of *H. halys* in the greater Allentown/Bethlehem area (bottom).

partment of Agriculture, Harrisburg), and Gary Bernon (USDA-APHIS, Otis ANGB, MA) for sharing with us their field observations on host plant records and feeding damage in the Allentown area; David A. Rider (North Dakota State University) for sharing information from his unpublished catalogue of world Pentatomidae on the synonymy of *H. halys*; Toshio Shono (Cornell University) for providing some English translation of Japanese; Robert A. Schall

(USDA-APHIS-PPQ) for assisting in finding literature references on *H. halys*; Peter Touhey (Systematic Entomology Laboratory, USDA-ARS, Beltsville, MD) for sharing interception data; Kent Loeffler (Cornell University) for providing the photographs used in Figs. 1–8 and for facilitating the figure reproductions; and A. G. Wheeler, Jr. (Clemson University) and D. A. Rider for reviewing and giving critical comments on a draft of the manuscript. We are in-

debted to J. Stimmel for providing the digital images used in Fig. 9 and to him and K. Bernhard for also reviewing a draft of the paper.

This research was supported by the Cornell University Agricultural Experiment Station federal formula funds, Project No. NYC-139413 to ERH, received from Co-operative State Research, Education, and Extension Service, U.S. Department of Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the U.S. Department of Agriculture.

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Note added in proof.—In late August 2002, specimens of *H. halys* were retrieved

from light traps in Phillipsburg (Warren Co.) and Little York (Hunterdon Co.), New Jersey that were operated by Rutgers University Cooperative Extension (Barry Emens, USDA-APHIS-PPQ, Trenton, NJ, personal communication). These collections represent a new state record for New Jersey.

While conducting a delimiting survey near Allentown, Pennsylvania, James Stimmel, Gary Bernon, and ERH collected *H. halys* at Stewartsville (Warren Co.), New Jersey on October 2, 2002, and at Mertztown (Berks Co.), Pennsylvania on October 3, 2002. Berks County is a new county record for Pennsylvania.